

### Affective influences on interpersonal perceptions

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Affective Influences on  
Interpersonal Perception

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# **AFFECTIVE INFLUENCES ON INTERPERSONAL PERCEPTION**

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Running head: Affect and judgments

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## **Abstract**

What role do feelings play in interpersonal perception? This chapter reviews our empirical research program on affective influences on social judgments, and a new theoretical framework accounting for such effects is presented. In the first section, models of social judgment, and the affect-priming framework are outlined. Empirical work on affective influences on social judgments is reviewed next. Results show robust and reliable mood effects on a variety of social judgments, from simple behaviour interpretation tasks to complex and demanding attribution and interpersonal preference judgments. The role of affect in social judgments by children, in discussion groups, and in field settings is also considered, and evidence for the affect-priming model from reaction-time studies is summarized. In the final section, more recent theoretical formulations are discussed, and a multi-process model able to account for the empirical findings is presented. The implications of these results for everyday social judgments, and for contemporary models of social cognition are considered.

## Introduction

It has been well recognized by writers, artists and philosophers throughout the ages that emotions often influence the quality of our social judgments. Descartes (1649) proposed such a link between 'feelings' and 'thinking' almost 350 years ago, as did James (1890) in his 'Principles of Psychology'. Yet psychological research on this intriguing problem is a relatively recent development. It is only in the last few decades that empirical studies investigated some of processes that mediate affective influences on social perception and judgments. This chapter reviews our empirical research program on the role of affective states in social judgments, and a new multi-process theoretical model accounting for such effects is outlined.

### Interpersonal judgments

Feelings must clearly be a part of any plausible model of social perception. As Zajonc (1980) argued, affect is perhaps the primary medium of interpersonal behaviour, and affective reactions may often precede or inform subsequent cognitive elaborations (cf. Clore & Parrott, 1991; Niedenthal & Showers, 1991; Schwarz & Bless, 1991). Strong affective responses to others may be triggered by such fleeting cues as a facial expression, a tone of voice or a nonverbal gesture (cf. Forgas, 1988; Forgas, O'Connor & Morris, 1983; Niedenthal & Showers, 1991). What is it about social judgments that makes them sensitive to such affective influences?

*The nature of social judgments.* Unlike physical perception, social judgments require the use of high-level cognitive processes necessary to infer characteristics that are not directly observable (Kelly, 1955). Affect can play an important role in person perception both through (a) influencing the kind of information processing strategy adopted by judges (Forgas, 1981b; 1983b), and (b) through its influence on the way social information about another person is attended to, selected, interpreted, learned, remembered and evaluated in judgments (Bower, 1991; Clore & Parrott, 1991; Forgas & Bower, 1988; Schwarz, 1990). In

essence, it is the constructive, inferential nature of social perception processes that underlies affective influences on judgments.

*Constructivist vs. mechanistic approaches.* The constructive, top-down nature of person perception has been clearly recognised since classical theorists such as Heider (1958), Kelly (1955) and Asch (1946) first argued that the expectations and ideas of the perceiver have a major impact on judgments. Judgments of even the simplest kind of person stimuli are subject to constructive perceptual biases as the perceiver seeks to impose shape, form or 'Gestalt' on the stimulus (Asch, 1946). Kelly's (1955) work on personal constructs, and later research on implicit personality theories yielded hard empirical evidence for the important role of constructive processes in person perception (Rosenberg & Sedlak, 1972). Remarkably, the role of affect in that process has not received much attention until quite recently.

The strong tradition of constructivism in person perception was counterbalanced by a second perhaps more atomistic and mechanistic approach. 'Cognitive algebra', a field pioneered by Anderson (1974) and rooted in the psychophysical measurement tradition conceptualized social judgments as the predictable outcome of simple, arithmetically derived information integration processes. The characteristics and constructions of the perceiver were of little interest within this paradigm, although affect could in principle be seen as part of the information integration process (Kaplan, 1991). Anderson's (1974) model assumes that (1) traits may be treated as in a sense 'given', and (2) that traits retain permanent, enduring meanings. Both of these assumptions are open to challenge. In social perception the information is hardly ever 'given' but has to be selected (Forgas, 1981b), and what is chosen has a major impact on judgments. Secondly, trait meanings are rarely constant; as Asch (1946) argued, traits seem to live an intensely social life, their meanings forever shifting and changing depending on what other information is available to the perceiver. It seems then that the information integration approach and its metaphor of the social perceiver as a passive information processor may at best be an incomplete account of interpersonal perception (cf. Argyle, 1991).

*The social cognition approach.* The holistic, constructivist and the mechanistic, reductionist views of person perception were ultimately reconciled in the current information processing paradigm. 'Person memory' is the study of the cognitive processes involved in the encoding, retrieval and combination of information about other people (Hastie, Ostrom, Ebbesen, Wyer, Hamilton & Carlston, 1980; Wyer & Srull, 1989). In these terms social perception is analogous to a process of semantic categorisation, involving the translation of information about people into semantic representations, and the activation of prior experiences and knowledge structures (Wyer & Srull, 1989).

It is the process of activation of representational structures that allows perceivers to 'go beyond the information given', by engaging in 'top-down' processing, making inferences and attributions about their target based on their prior experiences with people. The model links person perception, clearly a high-level cognitive process, with established information processing and memory paradigms in cognitive psychology. However, as we have argued some years ago, the 'person memory' paradigm continues to assume 'cold' cognition on the part of the perceiver, where feelings, evaluations and preferences are relatively neglected (Forgas, 1981b; 1983b). The model's focus on the isolated, lonely perceiver separated from the social and cultural context has been another point of criticism (Argyle, 1991).

It is also memory-based models, such as the associative network model developed by Bower (1981; 1991) and Isen (1984; 1987), that first explicitly dealt with the role of affect in cognition and judgments. It is this formulation that initially stimulated our work on mood effects on social judgments.

### **Affect-priming models**

To the extent that social perception is constructive, the availability of memories, constructs and associations will have an influence on this process. Memory-based expectations and assumptions will influence the evidence we select, the interpretations that we make and ultimately, the judgments we arrive at. As most social behaviours are complex and ambiguous, alternative and often conflicting interpretations are always

possible (Heider, 1958), and typically there are few real criteria for deciding the accuracy of judgments.

In his associative network model, Bower (1981; 1991) suggested that mood states may be linked to cognitions within a single associative network of representations. Affect may influence judgments through the automatic priming of its associated cognitive constructs, as "activation of an emotion node also spreads activation throughout the memory structures to which it is connected" (Bower, 1981, p.135). This is essentially a memory model, accounting for the role of affect in information storage and retrieval. However, the model also has wide-spread consequences for social judgments, as it implies that the experience of a mood state will -

(a) facilitate the learning of mood-congruent information because of the availability of a richer mood-congruent associative base (*mood-congruent learning*);

(b) selectively focus attention on mood-congruent information (*mood-congruent attention*);

(c) facilitate the recall of information encountered in a matching mood state (*mood-state dependent memory*), and

(e) through the superior availability of mood-consistent constructs and associations, facilitate the interpretation of ambiguous information in a mood-consistent manner (*mood-congruent associations*).

The cumulative effect is a mood-consistent bias in social judgments. According to the model, feelings influence not only what we see, learn and pay attention to, but also what we remember, the associations we form and the way we interpret the available information. In brief, affect has a similar role to enduring expectations and 'implicit theories of personality' in guiding the constructive aspect of social judgments (Asch, 1946; Kelly, 1955; Rosenberg & Sedlak, 1972).

The model has received varied empirical support (Blaney, 1986), although the judgmental effects are now well established (Bower, 1991; Forgas, 1990; Forgas & Bower, 1988; Mayer et al., 1990). It was this model that provided the initial impetus for much of our work on social judgments.

*Affect, mood and emotion.* The feeling states we studied are similar to the mild, nonspecific experiences of feeling 'good' or feeling 'bad', a common experience in everyday life. The precise definition of the terms 'affect', 'mood' and 'emotion' remains unresolved in the literature. For our purposes, we shall use the term 'affect' to include both moods and emotion. In turn, moods, unlike emotions, are less intense, are more enduring, and usually do not have a salient immediate antecedent cause, or much cognitive content.

*Prior evidence for mood effects on judgments.* Although concentrated research on this topic is a fairly recent development, there have been several demonstrations of mood effects on social judgments in the literature. As early as 1940, Razran found that good or bad mood (induced by a free lunch, or unpleasant smells) influenced judgments of persuasive messages. Later, the tendency by fearful subjects to perceive another person as fearful was interpreted in psychoanalytic terms by Feshbach & Singer (1957), as "suppression of fear facilitates the tendency to project fear onto another social object" (p. 286). Other studies manipulated affect through the behaviour of a confederate (Izard, 1964; Wehmer & Izard, 1962), and found positive mood effects on judgments and performance.

More recent evidence indicating more negative judgments when taken in aversive environments (Griffith, 1970), after seeing depressing films (Gouaux, 1970) or after negative interpersonal feedback (Gouaux & Summers, 1973) was interpreted in terms of conditioning processes (Clore & Byrne, 1972). Neither the psychoanalytic, nor the conditioning models deal with the cognitive consequences of affect, although Feshbach & Singer's (1957) proposition the cognition in a sense becomes 'infused' by affect comes closest to contemporary theorizing. Accounting for how such 'infusion' comes about is

precisely what affect-priming theories are about, and what our experiments, described below, were designed to explore.

### **Affect in social judgments: empirical investigations**

In recent years, our studies investigated the role of low-intensity, transient moods in a variety of social judgments (eg. Forgas, 1989; 1990; 1991a,b,c; Forgas & Bower, 1987, 1988; Forgas, Bower & Krantz, 1984; Forgas, Bower & Moylan, 1990; Forgas, Burnham & Trimboli, 1988; Forgas & Moylan, 1987). In describing this research, we shall proceed from looking at simple, basic judgments to more complex, elaborate decisions about attributions and interpersonal choices. Work on mood effects on social judgments in children, and on group judgments will also be summarized.

#### **The basic effect: mood and behaviour interpretation.**

In an early experiment we (Forgas, Bower & Krantz, 1984) examined how moods influence the way people perceive and interpret their own, and others', social behaviours. The basic interpretation of simple social acts is the foundation of person perception (Heider, 1958). Such judgments are often data-driven, and to make the test of mood effects on judgments even more challenging, we used videotaped behaviours to provide subjects with objective behavioural evidence.

Pairs of subjects were videotaped in four different interaction episodes of varying formality and intimacy (Forgas, 1982), in what they believed were trial interviews with female interviewers. One day later, in a 'separate' experiment, subjects were hypnotically induced to feel happy or sad. They then looked at the video-tape of their interactions the day before, and were asked to rate positive, skilled, and negative, unskilled behaviours both for themselves and for their partner.

We found a strong mood bias in these judgments that was universal across the four interaction episodes, suggesting the cross-situational generality of this result. Happy subjects saw more positive, skilled and fewer negative, unskilled behaviours than did sad subjects (Figure 1). Sad subjects, however, were particularly critical of themselves, a pattern similar to the self-deprecating bias often found in depression (Roth & Rehm,

1980). Happy subjects also recalled more details about easy, informal episodes, while people in a sad mood remembered more about difficult, formal interaction episodes, a pattern suggesting a mood-state dependent memory effect.

#### FIGURE 1 ABOUT HERE

These results generally support an affect-priming model, suggesting that even basic interpretations about ongoing social behaviours are influenced by the selective priming of mood-congruent constructs. The self-other differences in negative mood may be due to the superior priming self-deprecatory yet other-enhancing cognitions, a thought pattern probably common in dysphoria (Ottaviani & Beck, 1988). Further, social norms are also more likely to inhibit negative judgments of others rather than the self, contributing to the asymmetric positive-negative mood effects found here and elsewhere.

This experiment presented a particularly challenging test of mood biases in social perception. Most everyday social judgments are based on far more elusive evidence than videotaped encounters, and are thus even more likely to be influenced by moods. The self-other differences found here are consistent with other evidence, as well as clinical research (Forgas & Bower, 1988; Ottaviani & Beck, 1988), and offer an experimental demonstration of depressogenic cognition (Roth & Rehm, 1980).

#### Processing effects: reaction time data

In follow-up experiments we sought to precisely measure the processing times and latencies of judgments as a function of the subjects' mood state. In one such study (Forgas & Bower, 1987), happy, sad or neutral subjects read positive or negative details about other people on a computer screen as part of an impression formation task. In fact, the computer was programmed to accurately record how long each subject took to read each piece of positive or negative information about a person, and how long they took to make each positive and negative impression formation judgment.

Consistent with affect-priming models, we found that people took longer reading, and learning information that matched their mood state (Figure 2), presumably because of the



longer, and more thorough encoding of mood-consistent information into an extensive and already activated associative base (Bower, 1991).

The selective attention to, and learning of mood-congruent details resulted in happy people making more positive judgments, and sad people being more critical in their perceptions of the same target. We also analysed how long it took subjects to make positive or a negative judgments. Results showed that mood-consistent judgments took less time to make than inconsistent judgments, due to the superior priming of mood-consistent constructs (Figure 2).

#### FIGURE 2 ABOUT HERE

These results are broadly consistent with priming models suggesting that by "spreading activation, a dominant emotion will enhance the availability of emotion-congruent interpretations and salience of congruent stimulus materials for learning." (Bower, 1981, p.451). A richer associative base may lead to the slower and more detailed processing of mood-consistent information in a learning task (Craig & Tulving, 1975), but the faster recall of mood-consistent details in a judgmental task.

#### Developmental aspects: Affect and judgments in children

Most research on mood and judgments focuses on adults. Little is known about mood effects on how young children learn, remember and use information in their social judgments about others. In one study, we (Forgas, Burnham & Trimboli, 1988) asked school children to form impressions about two other children, while they were experiencing happy or sad moods after watching cheerful or depressing videotapes. A day later, a matching or non-matching mood state was induced, and the children's memory and person perception judgments were assessed. We found evidence for mood-state dependent memory, as characters seen in matching encoding and retrieval moods were remembered better. Mood also provided a helpful differentiating context for remembering details about different targets (Bower, 1981). Interestingly, there was also a significant negativity bias in children's memory and judgments about others, rather than the positivity bias often found with adults. To the extent that children have a more restricted repertoire of emotional

experiences, and may not have fully internalized adult norms controlling negativity, these differences were not entirely surprising.

In general, we have found overall support in our studies for the kind of mood-induced perceptual biases predicted by the associative network model. However, negative mood effects were less consistent and robust than positive mood effects in this and other studies (Forgas et al., 1984; Forgas & Bower, 1987, 1988). One explanation for this is normative: rules and norms constraining negative affect and its expression may be superimposed on the kind of symmetrical, automatic priming effects predicted by the network model. Greater negativity bias by children than adults is consistent with this account (Forgas et al., 1988). Negative moods may also trigger more systematic and effortful information processing (Clark & Isen, 1982), while positive moods lead to more simplified, heuristic processing strategies (Schwarz, 1990). Some of these issues were explored in our more recent experiments, looking at mood effects on complex social decisions and attributions (Forgas, 1990, 1991a,b; Forgas, Bower & Moylan, 1990).

#### **Affect and attribution judgments**

In a series of recent experiments, we looked at affective influences on attributions for achievement (Forgas et al., 1990). This topic is of particular interest because causal attributions are not in themselves valenced, and demonstrating mood effects on such judgments would help to extend the generality of the paradigm. Mood effects on achievement attributions are also of substantive interest. Despite the roots of attribution research in phenomenological theorizing (Heider, 1958), perceiver characteristics such as mood received surprisingly little interest in the attribution literature. This is all the more surprising as achievement attributions are closely related to motivation, and have been shown to have significant motivational and affective consequences (Weiner, 1980). By comparing attributions for self and others for success and failure outcomes, we may also contrast motivational and cognitive theories. The self-serving motivational account implies more self-enhancing and other-deprecating judgments in dysphoria. Cognitive accounts in

contrast imply the opposite; as primed negative cognitions should selectively bias judgments of the self, but less so of others (Forgas & Bower, 1988; Roth & Rehm, 1980).

In the first experiment in this series, subjects feeling happy or sad after watching a videotape made attributions for success or failure in typical 'life dilemmas' (e.g. succeeding or failing in a job, winning or losing on an investment, etc.). We found that happy subjects made more lenient attributions, identifying internal, stable causes for success, and external, unstable causes for failure, while sad subjects did the opposite.

Having established the basic effect, the next experiments extended these findings by (a) looking at real-life rather than hypothetical outcomes, (b) comparing attributions to the self vs. attributions to others, (c) specifically assessing the role of cognitive as against motivational processes in the attribution outcome, and (c) exploring the role of mood states in self-efficacy judgments (Bandura, 1977). In attributions for a real-life event, doing well or badly at an exam (Arkin & Maruyama, 1978), subjects in the control group demonstrated the now familiar self-serving bias, giving more internal and stable attributions for their own successes than failures compared to their attributions to others (Figure 3). Positive mood led to a relative decline in the ego-defensive bias, with comparatively more favourable attributions to both self and other. Surprisingly, when depressed and presumably most in need to ego-defensive attributions, sad mood subjects were particularly critical of themselves, blaming stable and internal causes for failure, and crediting unstable, external causes for success. Yet others continued to be given credit for success, and no blame for failing (see Figure 3). This absence of self-serving bias in negative mood is inconsistent with motivational accounts, but appears consistent with cognitive explanations.

#### FIGURE 3 ABOUT HERE

In further experiments, we looked at mood effects on quantitative estimates of performance by self and others, as well as self-efficacy judgments. Results were consistent with the earlier studies. For example, we found further evidence for self-deprecatory but other-enhancing judgments in dysphoria, as subjects tended to overestimate the level of achievement by others, and underestimate their own level of efficacy in future tasks when

compared to control and positive mood subjects. These results help to link mood effects on attribution judgments to future achievement, as several studies now show that self-efficacy judgments are a significant predictor of subsequent achievement and performance (Bandura, 1977).

The self-other differences found here suggest the selective recall of other-enhancing and self-deprecatory cognitions in dysphoria. These differences appear consistent with affect-priming models, but may at first seem difficult to reconcile with affect-as-information theories (Schwarz, 1990; Schwarz & Bless, 1991), as it is unclear how the same negative affective state could simultaneously inform negative judgments of the self, but positive judgments about others. However, more recent versions of the affect-as-information models allow for this possibility by specifying that affect may selectively inform judgments about the source to which it is attributed (in this case, the self) without similarly influencing judgments about others (Schwarz & Bless, 1991). The kind of self-other differences found here also mirror the clinical evidence (Ottaviani & Beck, 1988; Roth & Rehm, 1980) as depressed patients often exhibit identical self-specific negative biases in judgments.

### **Affect and interpersonal preferences**

Interpersonal choices are among the most complex kinds of decisions people make about each other. Selecting an interaction partner is an important and recurring feature of both our private and our working lives. Even enduring relationships may be seen in terms of a consecutive series of positive partner choices (Levinger, 1990). Evidence for the role of affect in interpersonal preferences comes from the early work of Schachter (1959) and Sarnoff & Zimbardo (1961). Recent evidence also shows that interaction with others in a matching mood is more rewarding (Locke & Horowitz, 1990). Surprisingly, the information processing strategies underlying such motivated interpersonal choices received little attention to date. Yet there is growing recognition of the motivated character of many basic cognitive processes in the recent social cognition literature (Kunda, 1990; Parrott & Sabini, 1990; Sanitioso, Kunda & Fong, 1990; et al.). The analysis of mood effects on motivated interpersonal choices was the aim of these experiments (Forgas, 1991a).

We expected that the combination of negative mood and making an interpersonal choice with personal consequences will lead people to employ targeted, motivated processing strategies. Motivated processing implies a directed search for a rewarding partner, involving a selective bias towards information relevant to that objective in the course of the decision process. These expectations can no longer be derived from affect-priming theories, which imply relatively unbiased, symmetrical and un-motivated cognitive processing. In terms of Zajonc's (1980) arguments, these experiments demonstrate decision processes when preferences do indeed precede inferences.

The procedure in this series of investigations required subjects make an interpersonal choice, selecting a partner either for themselves (high personal relevance) or somebody else (low personal relevance) for a cooperative task, while they were experiencing a positive, neutral or negative mood state induced in an ostensibly separate experiment. We carefully analyzed not only the outcome of people's interpersonal choices, but also the kind of information they selected, and the speed, efficiency, and the information-search strategies they employed (Forgas, 1989; 1991a).

In the first experiment, four potential partners were described in terms of twelve features, including both desirable and undesirable, and social and task-related characteristics. We found a significant tendency by sad subjects to prefer partners with desirable social characteristics for themselves, but to choose partners with good task skills for others. Sad subjects also remembered more social than task information later on, but only when the choice was personally relevant to them. These judgmental and memory biases go beyond affect-priming models, and show the influence of secondary, motivated preferences on information processing (Kunda, 1990).

Our next experiment used an improved methodology to more accurately chart the exact steps involved in making an interpersonal decision. This time, potential partners were described in 'personal files' on a series of cards. Subjects were asked to sequentially number every card (information unit) as they looked at it, and also rate the relevance of the information it contained. This way, a step-by-step record of the decision processes and the perceived contribution of each information unit was obtained.

## FIGURE 4 ABOUT HERE

We again found strong evidence for motivated processing by dysphoric subjects. They preferred socially rewarding rather than competent partners for themselves, but not for others, and were relatively faster in reaching such a decision (Figure 4). Dysphoric subjects also preferred social to task information, and used an impression formation rather than a comparison-by-features strategy in their choices. In contrast, positive mood subjects used an efficient and reasonably appropriate strategy by focussing on task-related features. These results complement previous work on mood effects on complex decisions (Janis & Mann, 1977). Although in some studies mood had no effect on hypothetical choices (Isen & Means, 1983), our results suggest that motivated processing may be a feature of involving, personally relevant choices only (Kunda, 1990).

In the next experiment in this series, we introduced a computer-controlled procedure to present the information about potential partners, and to measure the time it took for subjects to select, and examine each item of task or social information. With this more sensitive procedure, results once again confirmed the use of directed, motivated decision processes. In particular, we found that sad subjects making a personal choice required less time to select a social as against a task-related item of information, but took significantly longer reading and examining such details. Consistent with experiment 1, their memory for such information was also superior.

These three experiments then offer convergent evidence for the role of moods in triggering motivated choice strategies. These effects are quite different from the kind of unbiased, automatic processes predicted by affect-priming theories (Bower, 1991; Forgas & Bower, 1988). Evidence for the motivated character of social information processing is now beginning to emerge from other areas of social cognition research (Kunda, 1990; Petty & Cacioppo, 1986; Schwarz, 1990; Strack et al., 1988; Tesser, 1986). Indeed, it seems that dysphoria may often generate intentional, motivated strategies specifically designed to eliminate the unpleasant affective state (Clark & Isen, 1982). Motivated processing is a common and as yet little researched strategy in person perception that probably plays an important role in many interpersonal judgments both by normal and by depressed

populations (Ottaviani & Beck, 1988). Any comprehensive theoretical account of mood effects on social judgments would have to include motivational processing as one of the available processing strategies to subjects.

### **Affect in group versus individual judgments**

The studies described so far - as indeed almost all research on social cognition - focus on the behaviour of isolated individuals (Forgas, 1981b; 1983b). Yet realistic analyses of social behaviour cannot remain exclusively at the level of the individual (Argyle, 1991). In contemporary society, many important judgments and decisions are made by groups, in the belief that such choices will be less biased and more representative of collective preferences. In particular, groups are supposed to eliminate affective biases that may distort individual judgments. We examined this assumption in one of our experiments, comparing mood effects on individual and group judgments (Forgas, 1990).

Existing research suggests that group discussion per se may be the source of significant bias in the decision-making process (Forgas, 1977; 1981a; Moscovici & Zavalloni, 1969). In our study, individual and group judgments of nine person categories (e.g. farmers, Catholics, doctors, Italians) were performed by the same people on two different occasions, separated by a two-week interval. A happy, neutral or sad affective state was induced in subjects using videotaped presentations before each of the individual and the group judgments, in a complete factorial design.

We again found a significant mood-congruent bias on individual judgments. Perceptions on three judgmental dimensions - evaluation, competence and self-confidence - were more positive in a happy mood, and more negative in a sad mood than judgments by controls, as implied by affect-priming models. However, we also found an interaction between mood and the influence of group discussion on judgments. In a positive mood the extremity of group judgments increased further than for individuals, consistent with the predictions of group extremity shift theories. In essence, this is due to the combination of two processes, mood-congruent judgmental bias, accentuated by group-induced extremity shift. In contrast, in a negative mood there was no difference in the extremity of individual



vs. group judgments. In fact, there was a slight trend for negative individual judgments to become somewhat less extreme after a group discussion.

How can we account for these effects? It is likely that mood had an influence on the kind of processing strategies adopted by groups under these circumstances. The combination of group discussion and negative mood should have triggered a more careful and controlled processing strategy (Schwarz, 1990), a style involving careful, systematic processing, which should have led to the consequent reduction in the negativity of judgments. Such a processing and interaction style would also tend to highlight the norms constraining negative judgments of others. Both of these processes should act to selectively inhibit the extremity of negative judgmental biases, but not positively biased judgments. We are now doing further work looking at the actual interactive strategies used by people when making group judgments in different moods to obtain more direct evidence for these effects.

### Context effects on processing style

It appears from these studies that the kind of processing style adopted by people when making a judgment has a crucial role on mediating mood effects. In several recent studies we looked at the role of various judgmental contexts in triggering different processing strategies, and thus differential mood effects. For example, would mood effects be greater when judging a couple that is well-matched or ill-matched in terms of physical attractiveness? We expected that judgmental contexts that are unexpected and unusual should trigger more constructive, elaborative processing styles, and these in turn would be more likely to be influenced by mood effects.

In one recent experiment we asked people to form impressions of heterosexual couples who were either well-matched or badly matched in terms of physical attractiveness. Mood had a significantly greater effect on judgments when the same person was part of an ill-matched couple than a well-matched couple (Figure 5). We know from research on personal relationships that similarity and balance is a major feature of relationships, a



point recognized both in theories of relationships (Heider, 1958; Levinger, 1990) and in empirical work on relationship perception (Forgas & Dobosz, 1980). Unbalanced physical attractiveness in a couple is atypical, and should have the effect of triggering more careful, constructive and analytic processing strategies. It is such constructive processing strategies that are more likely to be subject to mood-priming biases according to evidence from numerous studies (Fiedler, 1991; Forgas, 1991b), and our results appear to fit this pattern.

#### FIGURE 5 ABOUT HERE

#### **Mood effects on stereotyping.**

Of all social judgments, it is stereotype judgments that are most likely to involve an affective dimension, a link that is implied both by cognitive and motivational accounts of stereotyping (Hamilton & Rose, 1980; Tajfel & Forgas, 1981). Yet few studies looked at mood-based biases in stereotype judgments. Generally, it seems that factors that increase the difficulty of the judgmental task, such as complexity or time pressure also make stereotyping more likely (Bodenhausen & Wyer, 1985; Kruglanski & Freund, 1983). Mackie et al. (1989) found that incongruence between information valence and a person's mood also increased the illusory correlation bias.

Following from the previous experiment, in one of our recent studies we attempted to show that mood effects on stereotype perception would be greater when judgments are made in an unusual context. We expected and found that a judges' mood had a significantly greater impact on perceptions of Asian or Caucasian targets when these people were encountered in an unusual context, as part of a mixed-race dyad, than judgments of the same person when seen in a matched-race dyad (Forgas, 1991b) (Figure 6). These differences are again likely to be due to the different processing styles triggered by 'typical' and 'atypical' judgmental contexts. Seeing a person as part of a mixed-race dyad is more unusual and unexpected, and should trigger more detailed and systematic processing strategies, giving mood-primed associations a greater scope to influence such judgments.

## FIGURE 6 ABOUT HERE

**Affect and social judgments: evidence from field research**

The laboratory studies summarized above provide convergent evidence for mood effects on a variety of judgments. Such affective biases do of course have important practical implications for clinical psychology (Ottaviani & Beck, 1988) as well as other fields. It seems that many everyday judgments such as personnel selection (Baron, 1987), judgments about health and illness (Salovey et al., 1991), or subjective well-being (Diener, 1990; Strack, Schwarz, Argyle, 1991) and answers to surveys (Schwarz & Strack, 1990) are biased by affective state. It is of some importance then to demonstrate affective distortions in realistic field settings in order to establish the external validity of the phenomenon.

In several studies we found that judgmental distortions similar to those found in the laboratory can also reliably be obtained in natural settings. We used a variety of real-life events as mood manipulations. Supporters of winning or losing rugby teams, people who won or lost money in a betting shop, or received a small gift or a sweet in a shopping centre were our subjects, answering a variety of questions dealing with social judgments.

One study may suffice to illustrate our findings. In this investigation, almost one thousand visitors to happy, sad or aggressive films were interviewed immediately after leaving a movie theatre (Forgas & Moylan, 1987). They answered questions about a variety of issues, such as perceptions of political leaders, parties, as well as their life satisfaction and expectations about the future. Overall, subjects in a good mood after a happy film gave significantly more positive and lenient answers than did subjects who saw a sad or aggressive film (Figure 7). It seems that mood effects on social judgments are a common - and probably underestimated - feature of everyday life (cf. Schwarz, 1990; Schwarz & Bless, 1991; Strack et al., 1991). Indeed, it seems that even naturally occurring fluctuations of everyday mood are quite sufficient to induce strong and significant judgmental distortions (Mayer et al., 1990).

## FIGURE 7 ABOUT HERE

Despite strong cumulative empirical evidence for affective influences on social judgments, theoretical explanations of this phenomenon have not always kept pace with the research. The remainder of this chapter will be devoted to the development of an integrative theoretical framework capable of accounting for the empirical results so far available.

### **Theoretical considerations**

As the above review shows, mood-priming models can account for many, but not all of our findings. Several new theoretical models have also been proposed in recent years. We shall briefly survey these conceptual alternatives before proposing an integrative theoretical model of mood effects on social judgments.

#### **Alternative theoretical models**

*Affect-as-information theory.* Unlike affect-priming models that deal with indirect and automatic mood effects on cognition, affect-as-information models posit a direct, informational role for affect (Clore & Parrott, 1991; Schwarz & Bless, 1991). Accordingly, people form judgments based on a 'how do I feel about it?' heuristic (Schwarz & Clore, 1988), consulting their mood in order to infer their evaluative reactions to a target. The theory predicts that only previously unattributed feelings can influence judgments, consistent with its roots in the misattribution of emotion and arousal paradigm (Schachter & Singer, 1962).

The affect-as-information model has become an influential alternative to mood-priming formulations recently, and can also be extended to account for some mood-congruent memory effects (Schwarz & Bless, 1991). If affect guides judgments, mood-congruent judgments in turn will prime mood-congruent recollections. Schwarz (1990; Schwarz & Bless, 1991) further suggests that affect may serve as information about problematic or unproblematic environments (Frijda, 1986), triggering heuristic, effort-minimizing or systematic, effortful cognitive processing strategies.

Both the affect-priming and the affect-as-information models are essentially informational models, accounting for mood effects in terms of the direct or indirect informational consequences of moods. The two models are in a sense complementary rather than competing accounts (Bower, 1991; Clore & Parrott, 1991), often leading to similar predictions. The affect-as-information model deals with the *direct* informational functions of feelings, while affect-priming model refers to *indirect* effects. The affect-as-information model implies an all-or-nothing process, where judgments are fully affect-dependent or independent. Mood-priming in contrast implies a continuum of affective biases in judgments. In addition to these information-based models, a variety of process-based formulations have also been proposed recently to deal with mood effects on social judgments.

*Mood and processing style.* These models deal with mood effects in terms of contrasting alternative processing strategies. Clark & Isen (1982) distinguished between *automatic* processing such as the unconscious priming of mood-congruent information, and *controlled* processing, when conscious, effortful strategies are superimposed on an otherwise automatic process. Controlled processing may serve mood-maintenance in good moods, and mood-repair in bad moods. Our findings of mood-induced motivated processing in interpersonal preferences are consistent with such a controlled strategy. Others, such as Isen (1984; 1987) found that compared to control subjects, people in a positive mood often use more heuristic, truncated processing, use larger and more inclusive categories, are more creative, and are more likely to take risks as long this does not threaten their positive mood state. Such an effort-minimizing, simplifying processing style may be adopted because of the reduced *cognitive capacity* available to people when experiencing positive mood states, due to the activation of mood-related cognitions. Mackie & Worth (1991) found support for such a cognitive rather than motivational account of these processing differences.

Another dual-process model by Petty & Cacioppo (1987) seeks to account for reactions to persuasive messages. According to the *elaboration likelihood model* careful,

analytic or central-route processing or effort-minimizing, heuristic peripheral route processing may be triggered by a various personal and contextual factors. Affect may play an indirect role in central route processing, priming relevant information. In peripheral route processing affect may directly inform judgments (Schwarz, 1990). Petty, Gleicher & Baker (1991) found evidence for such an effect. Conversely, positive mood should induce peripheral route processing, and negative mood central route processing.

If affect is indeed a signal for benevolent or aversive situations (Clore & Parrott, 1991; Frijda, 1986), moods may *inform* us to engage in careful, effortful processing in dysphoria, and simplified, heuristic processing euphoria (Schwarz, 1990). This extension of the affect-as-information model seems to imply that processing decisions are in a sense post-judgmental, a point that may need further conceptual clarification.

Others, such as Fiedler (1991) distinguish between productive processes, involving the transformation, revision or elaboration of information, and reproductive processes based on mere information rehearsal. It is in productive processing that mood is more likely to play a role, while reproductive processes should be more impervious to mood states (Forgas, 1991a). Whether productive or reproductive processing occurs depends on the nature and complexity of the task, the kind of dependent variables used, and the state, motivation and characteristics of the judges, among others. Our studies showing greater mood effects in unusual contexts (when judging ill-matched couple, for example) are consistent with this approach.

What are the implications of these mood-process models for our understanding of mood effects on social judgments? These theories generally contrast two different processing styles, one simplified, effort-minimizing, expectation-driven, category-based and top-down, and the other analytic, accuracy-driven, attribute-based and bottom-up (Fiedler, 1991; Fiske & Pavelchak, 1986; Stangor, 1990; Wyer & Srull, 1989; et al.). The underlying common theme is that in some circumstances, people have little interest in the effortful analytic processing of a stimulus and rely instead on simplified, effort-minimizing strategies

based on their expectations and cognitive categories. At other times, more careful, systematic processing will be adopted.

Mood may be an antecedent as well as a consequence of these processing choices. Generally, we would expect positive moods to facilitate simplified, reproductive processing, and negative mood to cue systematic, effortful processing (Schwarz, 1990). This may occur for either motivational, or cognitive reasons. In motivational terms, mood-maintenance when feeling good, and mood-repair in dysphoria may account for these processing preferences (Clark & Isen, 1982). In cognitive terms, positive mood signals benevolent environments and little need for cognitive effort; negative moods in turn signal problematic situations and the need for more effort and vigilance (Schwarz, 1990). Drawing on these informational as well as mood-processing formulations, an integrative multi-process model of mood effects on judgments will be outlined next.

#### **A multi-process model.**

Based on the available evidence, no single information processing model is likely to account for all the observed strategies available to people when making a social judgment. This is hardly surprising. Indeed, it is curious that the kind of single-process models commonly adopted from cognitive psychology were ever seriously expected to account for the rich variety of social phenomena to which they are now applied. Information processing models are typically developed to deal with data obtained in highly controlled experiments. Social psychology in turn deals with complex, context-dependent processes, as is the case in social judgments. In everyday life people must have multiple information processing strategies available to them when making social judgments. What are these alternative strategies, and how does affect influence the selection of a particular strategy? We shall consider these questions next.

*Multi-process strategies.* It is proposed here that there exist four quite different processing strategies in person perception. How affect influences a judgment will depend on which processing strategy is adopted.

(1) A **direct-access strategy** is most likely when (a) the target is familiar, and (b) pre-existing crystallized judgments are available. In this case, judgment involves the direct retrieval of the prior evaluation, without any on-line computation. Probably many, if not most of our everyday judgments are made in this way. Direct access limits the potential for mood biases as cued retrieval processes are relatively robust, and stored perceptions are powerful and even resistant to disconfirming evidence (Snyder, 1984).

(2) A **motivated processing strategy** may be employed when a perceiver (a) has no prior crystallized judgment to fall back on, and (b) there are strong motivational forces for a particular judgmental outcome to be achieved. This is the case when preferences indeed do come to guide inferences (Zajonc, 1980). For example, in a dysphoric mood judgments may be oriented towards controlling the negative mood state (Clark & Isen, 1982; Forgas, 1991a). Affect is one, but not the only source of motivated processing. Personal relevance may also be a feature of motivated processing (cf. Forgas, 1989; 1990).

(3) The **heuristic processing strategy** is likely to be adopted when (a) no prior judgment is available, (b) no strong motivational forces mandating a particular outcome are present, (c) the judgment is made without the detailed consideration of the available information, because of (d) limits on cognitive processing capacity, or (e) lack of motivation. Judges may try to arrive at a judgment by the simplest and least effortful means, using irrelevant associations with extraneous variables (Griffitt, 1970), superficial similarity to a familiar category, or inferences from cues such prevailing affective state (cf. Clore & Parrott, 1991; Schwarz & Bless, 1991).

(4) A **substantive processing strategy** is likely when (a) no pre-formed judgment is available, (b) judges need to select, interpret and integrate novel information about a person in computing a judgment, and (c) they are motivated and have sufficient cognitive capacity to do so. This kind of processing is implied by traditional models of person perception (Anderson, 1974; Asch, 1946; Kelly, 1955; Rosenberg & Sedlak, 1972). The image of the 'dutiful information processor', dealing with the information as available, is



also at the heart of most cognitive models that assume automatic, uncontrolled, and fairly universal processing strategies. Many social-cognitive theories based on memory models also assume substantive processing in the assimilation of novel information into a pre-existing category system (Bower, 1991; Hastie et al., 1980; Wyer & Srull, 1989). It is in the course of substantive processing that affect can play a major role through priming constructs and associations to be used in judgments (Bower, 1981; Isen, 1984).

*Choice of processing strategy.* Such a multi-process model as outlined here implies that the final choice of a particular strategy is based on multiple criteria. The model also highlights the fact that substantive processing, far from being the standard procedure, may in fact be only a 'default' option, used only when none of the other strategies are appropriate. What influences the choice of a particular processing strategy? A brief summary of the various factors that play a role in processing choices is given below.

The degree of *familiarity* of the target is probably the first critical feature perceivers consider in deciding how to process a judgment. Well-known targets may be judged on the basis of the direct retrieval of pre-formed, crystallized evaluations. Heuristic or category-based processing may be adopted in forming a judgment about people who are familiar but without an available crystallized judgment. Unusual or unexpected judgmental contexts should reduce familiarity and lead to the substantive processing even of familiar targets such as racial stereotypes, as found in our experiments described above.

The level of *importance* of the judgment should determine whether a retrieved direct-access judgment of a familiar target, or a judgment formed on the basis of heuristic processing is adopted, or further processing is undertaken.

Motivational influences on processing choices may be of two kinds. A general motivation to be *accurate* may be the consequence of the importance of the judgment, or other cues such as the informational influence of a negative mood mandating a more cautious and effortful approach (Kunda, 1990; Schwarz, 1990). Alternatively, *specific motivation* in the service of particular goals, such as desire for mood improvement (Forgas,



1989), or the achievement of other objectives (Kunda, 1990) may also lead to motivated processing.

Cognitive *capacity constraints* may also have the effect of triggering heuristic processing strategies. Mood again may be one of the factors contributing to such capacity restrictions (Isen, 1984; Mackie & Worth, 1991).

Finally, the judges' transient *mood state* itself may directly trigger effort-minimizing or effortful processing strategies. It is important to note that mood also has an indirect effect on various other factors that influence processing decisions, such as motivational objectives or capacity limit variables.

#### FIGURE 8 ABOUT HERE

*Implications of the model.* According to such a multi-process model, the influence of affect on judgments largely depends on which of the various strategies is adopted. A direct-access strategy, relying on the direct retrieval of pre-formed judgments may be quite impervious to affective biases. The substantive processing strategy in turn is most likely to be subject to indirect affect-priming distortions, resulting in the biased selection, learning, interpretation and retrieval of information about people as predicted by affect-priming theories (Forgas et al., 1984; Forgas & Bower, 1987; 1988). Many of our studies described above provide evidence for such affect-based distortions in the substantive processing of person perception judgments (cf. Forgas & Bower, 1987; 1988). We know least about the second, motivated processing strategy (Kunda, 1990). However, there is now growing evidence that motivation plays a role not only in interpersonal preferences (Schachter, 1959), but also in many of the perceptual and judgmental processes underlying such choices, as we have seen above (Forgas, 1989; 1990; Kunda, 1990; Parrott & Sabini, 1990; Sanitioso et al., 1990). Heuristic processing in turn may be influenced by affect more directly, as moods themselves may be used as a source of heuristic information about reactions to a target (Schwarz & Bless, 1991).

The proposed classification of processing strategies also helps to highlight some of the critical features of these processing alternatives. *Full vs. partial information search*: For example, both heuristic and motivated processing involves only a partial search and consideration of the available information, while both direct access and substantive processing assume full information search strategies. *Pre-or post-judgmental processing*: In both direct access and motivated processing, the information processing serves to retrieve or support pre-existing preferences or judgments. Heuristic and substantive processing in turn are pre-judgmental, when subjects seek to compute a new evaluation. *Productivity*: In terms of Fiedler's (1991) notion of productivity, the degree of productive, transformational processing required (and the impact of mood on processing) would increase with the adoption of direct access, to motivated, to heuristic, to substantive processing strategies. *Top-down vs. bottom-up processing*: Top-down or category-based processing and the role of prior expectations and categories should play decreasing role in judgments as we progress from direct access to motivated, heuristic and substantive processing strategies. The role bottom-up, attribute-driven processing should increase in the same order.

### **Affect and choice of processing strategy**

The model implies that feelings do play a role in determining which processing strategy is adopted. Evidence for affect-mediated information processing comes from research on persuasive communication (Petty et al., 1991), as well as some of our earlier studies on person prototypes. Two conflicting processing strategies have been identified in research on person prototypes. Prototype-assimilation models (Cantor & Mischel, 1979) predict that highly prototypical targets (such as the 'extrovert' or the 'introvert') should be more memorable and more informative. But how would persons with unusual, non-typical characteristics be processed? Unusual, inconsistent or non-prototypical targets are often easier to encode and remember than are typical ones (Hastie & Kumar, 1979). Assimilating information to a pre-existing prototype is the easier, less effortful strategy not unlike the heuristic processing style described earlier. Dealing with non-typical targets in

contrast requires more effort and attention, as in the substantive processing strategy described above.

In one study, two levels of prototypicality (high vs. low) factorially combined with two levels of affective salience (high vs. low) to create realistic person stimuli (Forgas, 1983a). We found that affect selectively triggered heuristic or substantive processing (Forgas, 1983a; 1985), as salient, affectively loaded prototypes "dominate impressions, leading to the poor processing of prototype inconsistent characters. In the case of low salient prototypes the opposite effect was expected, with novel and prototype-inconsistent information .. leading to superior recall and predictions" (1983a, p. 156). These results are one of the few empirical studies demonstrating how affective states may determine whether substantive or heuristic information processing is adopted in these judgments. Following from these earlier studies, in a recently completed experiment we also found that the prototypicality of a target, and the mood of the judge had an interactive effect on selectively triggering heuristic or substantive processing strategies. Other recent work by Schwarz (1990; Schwarz & Bless, 1991) provided additional evidence and a theoretical rationale for such mood-based processing differences.

### Summary and conclusions

This chapter surveyed the main results of our research program on affective influences on social judgments, and the current theoretical status of the various explanatory models proposed to account for such effects. The evidence outlined indicates that short-term mood states do have a reliable and robust effect on a wide variety of social judgments, ranging from simple behaviour monitoring tasks to complex interpersonal preferences. Many - but not all - of these effects can be accounted for in terms of information-based models. The *affect-priming* framework predicts indirect mood effects on judgments through the selective priming and activation of mood-related constructs (Bower, 1991; Forgas & Bower, 1988). The strongest evidence for such a model comes from studies where learning, recall and judgmental latencies were carefully measured, and found to be consistent with affect-priming formulations (Forgas & Bower, 1987; Forgas et al., 1990). The *affect-as-*

*information* model in turn predicts mood-based distortions in circumstances when unattributed affective states can be mistakenly attributed to a judgmental target, offering an alternative explanation of some of these findings (Schwarz, 1990; Schwarz & Bless, 1991). For the first time, we have also described here a series of studies showing more than mere mood-congruency in judgments. Motivated processing (Kunda, 1990) involves the directed, selective search and use of information to achieve a particular objective, as in our studies on interpersonal preference. These results led us to propose a new, integrated multi-process model of affect in social judgments.

Based on the results of our own research project as well as others (Bower, 1991; Clore & Parrott, 1991; Fiedler & Forgas, 1988; Schwarz & Bless, 1991; et al.), in the final section of this chapter we proposed that four distinct information processing strategies are necessary to adequately account for the available empirical findings. (1) The **direct access strategy** is adopted when pre-existing, crystallized judgments are simply retrieved from memory. (2) **Motivated processing** characteristically involves the selective use and processing of information to serve a particular pre-existing objective. (3) **Heuristic processing** is adopted when judges choose to ignore or by-pass relevant information in order to simplify the judgmental task and form an impression using various shortcuts. (4) The **substantive processing strategy**, implicitly assumed by cognitive information processing models, occurs when the available information about a target is selectively processed, involving learning, associative and memory processes, in order to arrive at a novel judgment about a person.

These processing alternatives have their roots in various existing informational and process-based explanations, particularly in recent dual-process models (Fiedler, 1991; Petty et al., 1991). In turn, the multi-process model proposed here implies that affect influences (a) both the choice of a processing strategy, and (b) and subsequent learning and information processing.

Our results suggest that there is a pervasive tendency for people to perceive and interpret others in terms of their feelings at the time, and to use different information processing strategies depending on their temporary affective state. Affect-dependent

differences in information selection, retrieval and interpretation of the kind demonstrated here may have particularly important consequences for real-life interpersonal decisions and applied judgments in organisations (Baron, 1987) as well as in health-related fields (Salovey et al., 1991). There is some recent evidence suggesting that mood effects on cognition and judgments are most likely to be significant when the information base is complex and elaborate, selective and constructive processing is required, and the evidence is capable of supporting alternative interpretations (cf. Fiedler, 1991; Forgas et al., 1990).

We started this discussion by arguing that historically, at least two alternative conceptualizations of social judgmental processes can be identified. The first, constructivist approach assumes that person perception is an active, even creative category-driven process (Fiske & Pavelchak, 1986) where the characteristics of the judge are almost as important to the judgmental outcome as the characteristics of the target. The second view is more mechanistic, assuming that information about people is 'given', with permanent, enduring meanings, and that the study of person perception therefore involves the analysis of the combinatorial, information integration strategies used by people (Anderson, 1974). The eventual reconciliation of these conflicting frameworks in the current social cognitive paradigm led to the empirical study of affective biases in social judgments (Forgas, 1981b).

We may conclude by observing that although much has already been discovered about the information processing and representational functions of affective states, not enough is known about how affect triggers and influences different processing strategies. The multi-process framework for analysing affective influences on social judgments proposed here should be useful in focusing attention on this important and as yet insufficiently understood question.

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### FIGURE CAPTIONS

**Figure 1.** The effects of mood on perceptions of interactive behaviours in self and others (after Forgas, Bower & Krantz, 1984).

**Figure 2.** Affective influences on processing latencies. (a) longer processing times when reading mood-consistent rather than inconsistent information, and (b) shorter processing times when making mood-consistent rather than inconsistent judgments (after Forgas & Bower, 1987).

**Figure 3.** Mood effects on internal vs. external attributions for success and failure in an exam for self and other (after Forgas, Bower & Moylan, 1990)

**Figure 4.** The effects of mood on interpersonal preferences: (a) partner choices, and (b) decision speed.

**Figure 5.** Mood effects on judgments of the likeability of people in a well-matched or an ill-matched couple.

**Figure 6.** Mood effects on the perception of people in a same-raced or a mixed-race couple.

**Figure 7.** The effects of seeing happy, sad or aggressive films on four different kinds of social judgments.

**Figure 8.** A multi-process model of mood effects on social judgments.

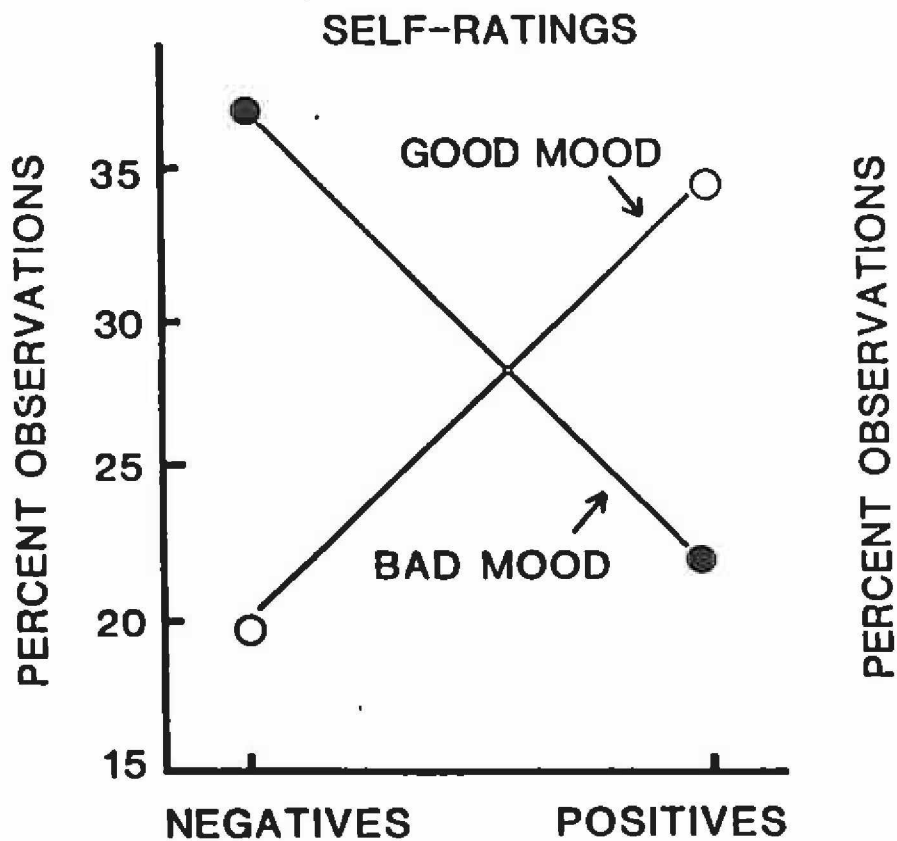
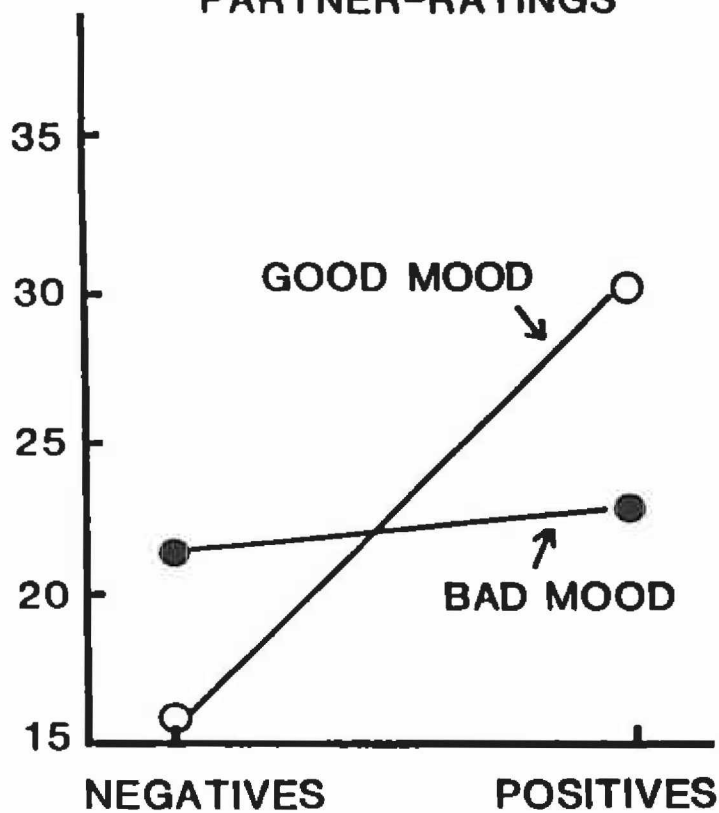


Fig. 1

## PARTNER-RATINGS



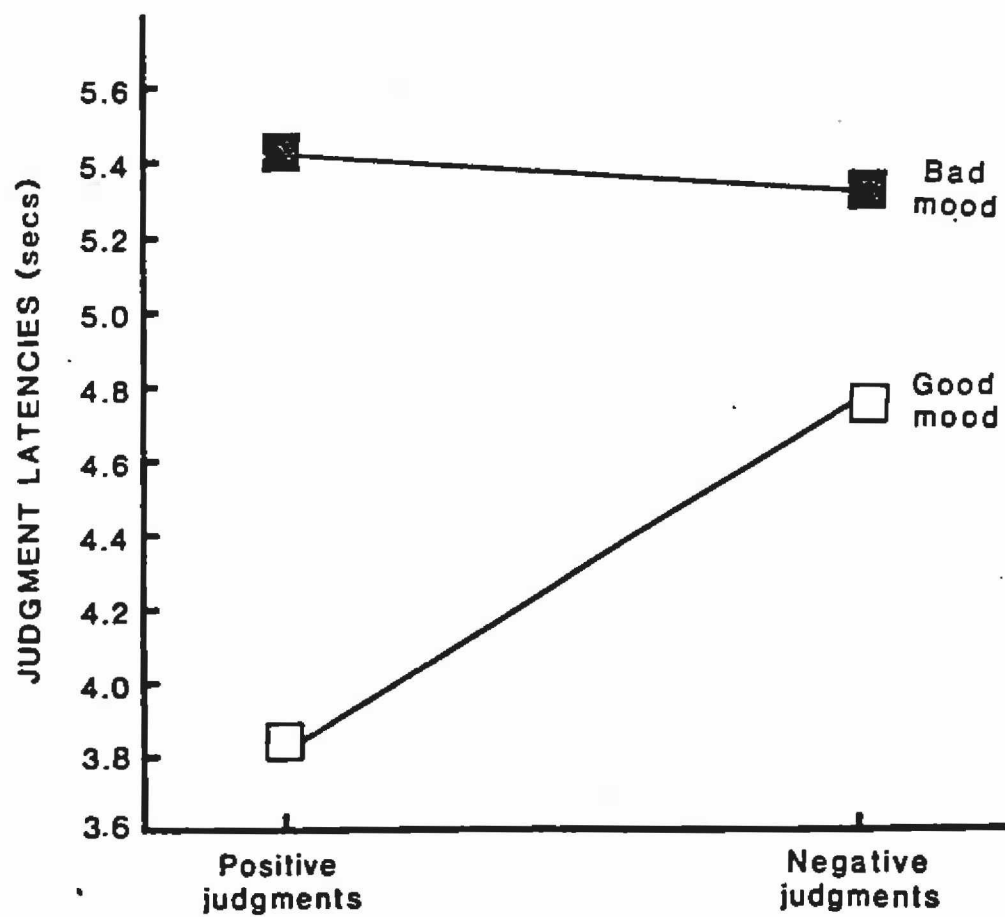
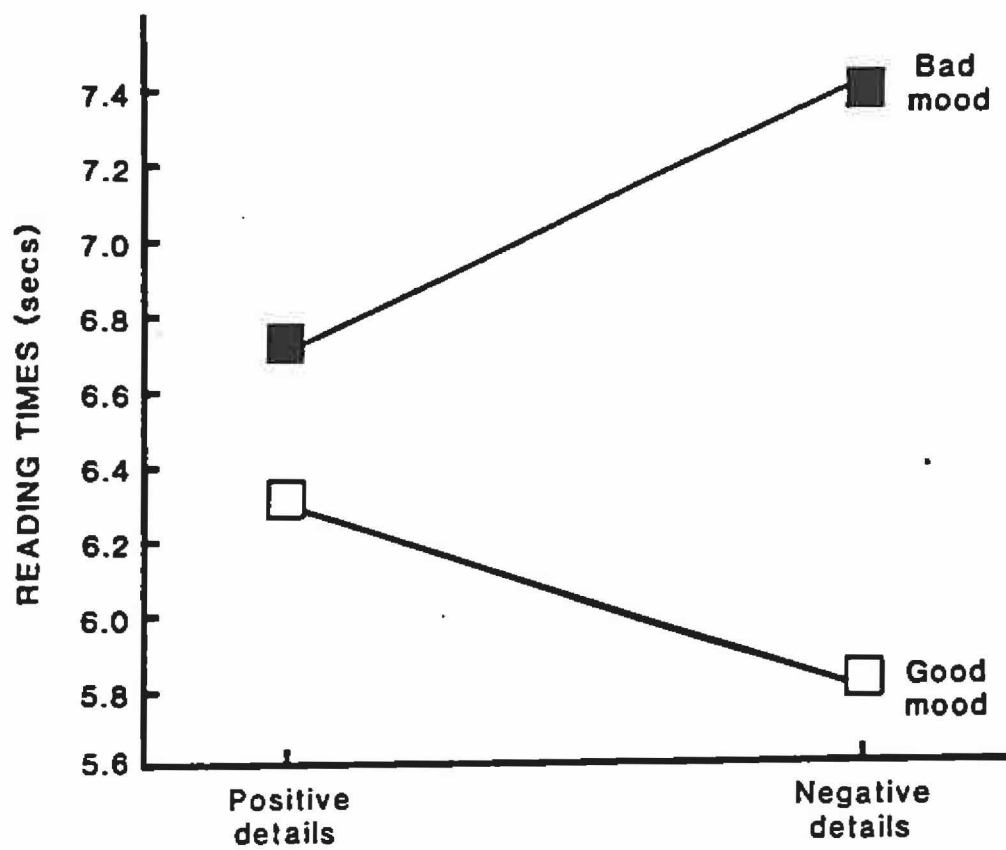


Fig. 2



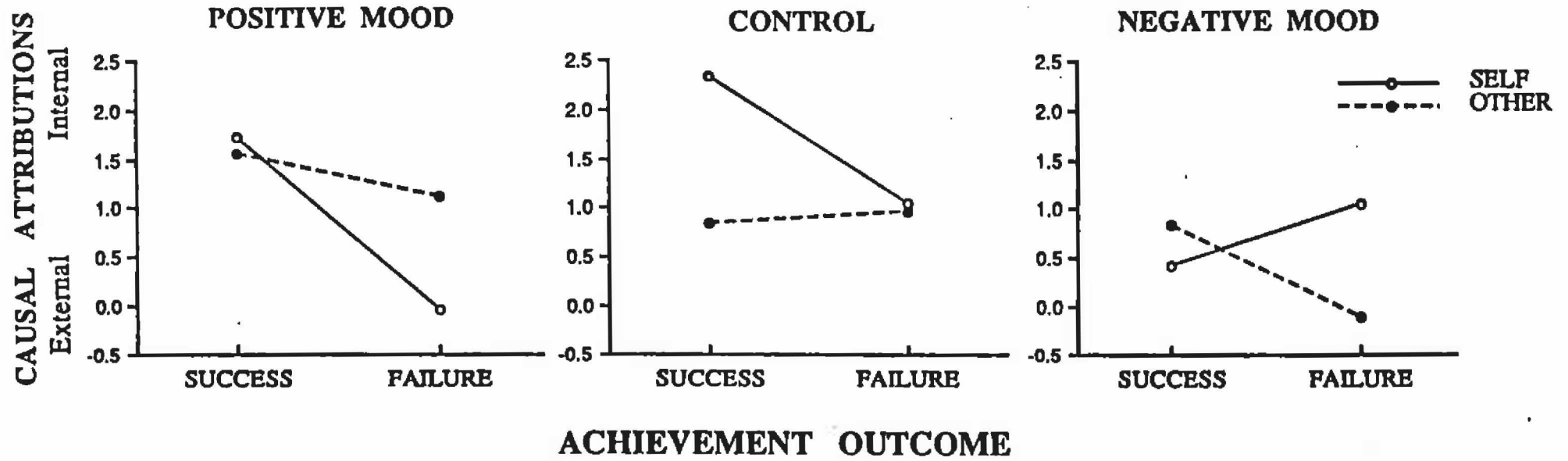
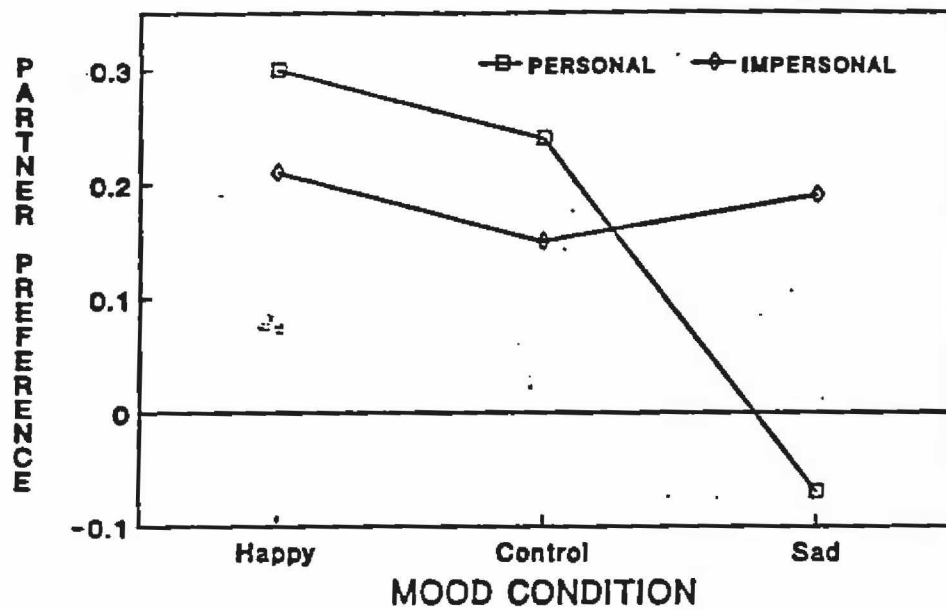


Fig. 3

# EXP. 2: INTERPERSONAL PREFERENCE AS A FUNCTION OF MOOD AND PERSONAL RELEVANCE



# EXP. 2: DECISION SPEED AS A FUNCTION OF MOOD AND PERSONAL RELEVANCE

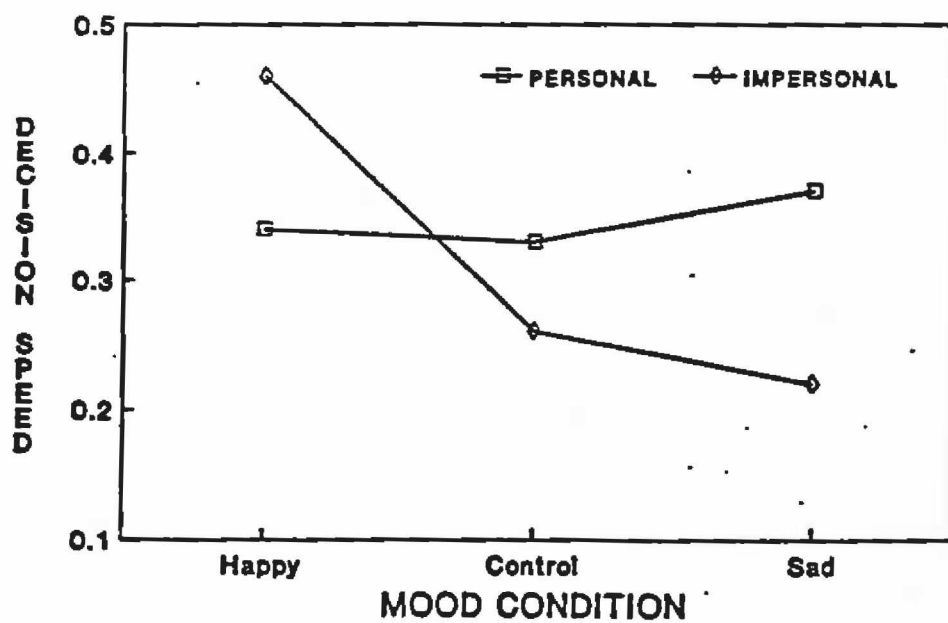


Fig. 4

# THE EFFECTS OF MOOD AND PHYSICAL ATTRACTIVENESS ON LIKEABILITY JUDGMENTS

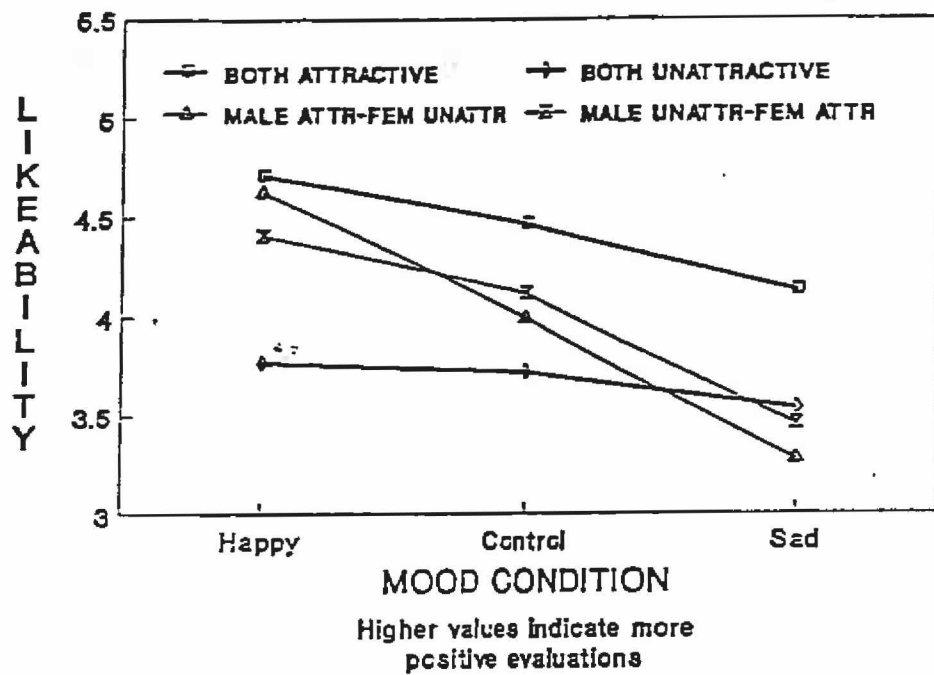


Fig. 5

# THE INFLUENCE OF AFFECT AND RACIAL BALANCE ON LIKEABILITY JUDGMENTS

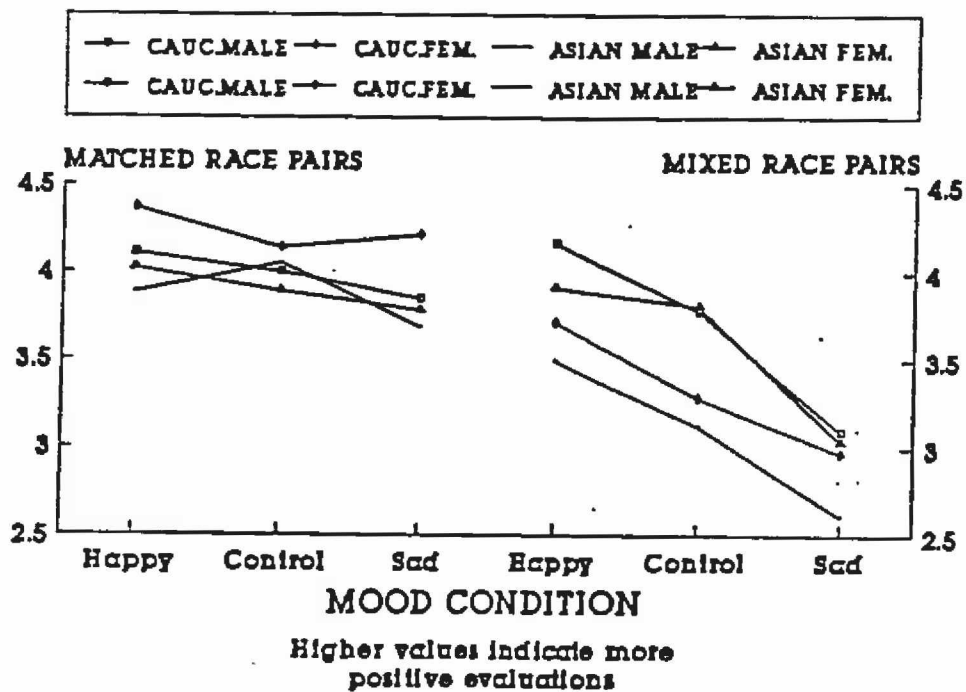


Fig. 6

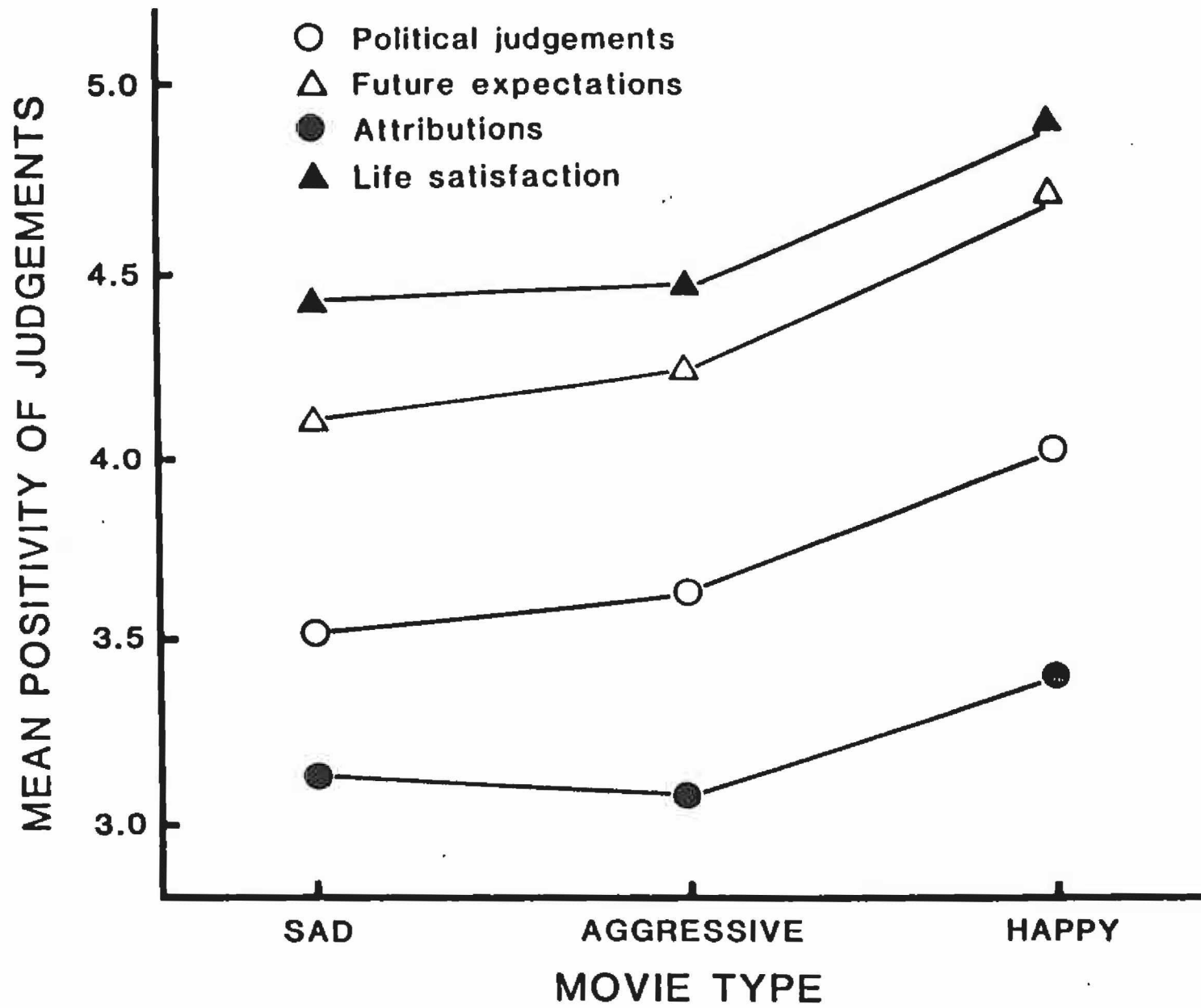


Fig. 7

A MULTI-PROCESS MODEL OF MOOD EFFECTS ON SOCIAL JUDGMENTS

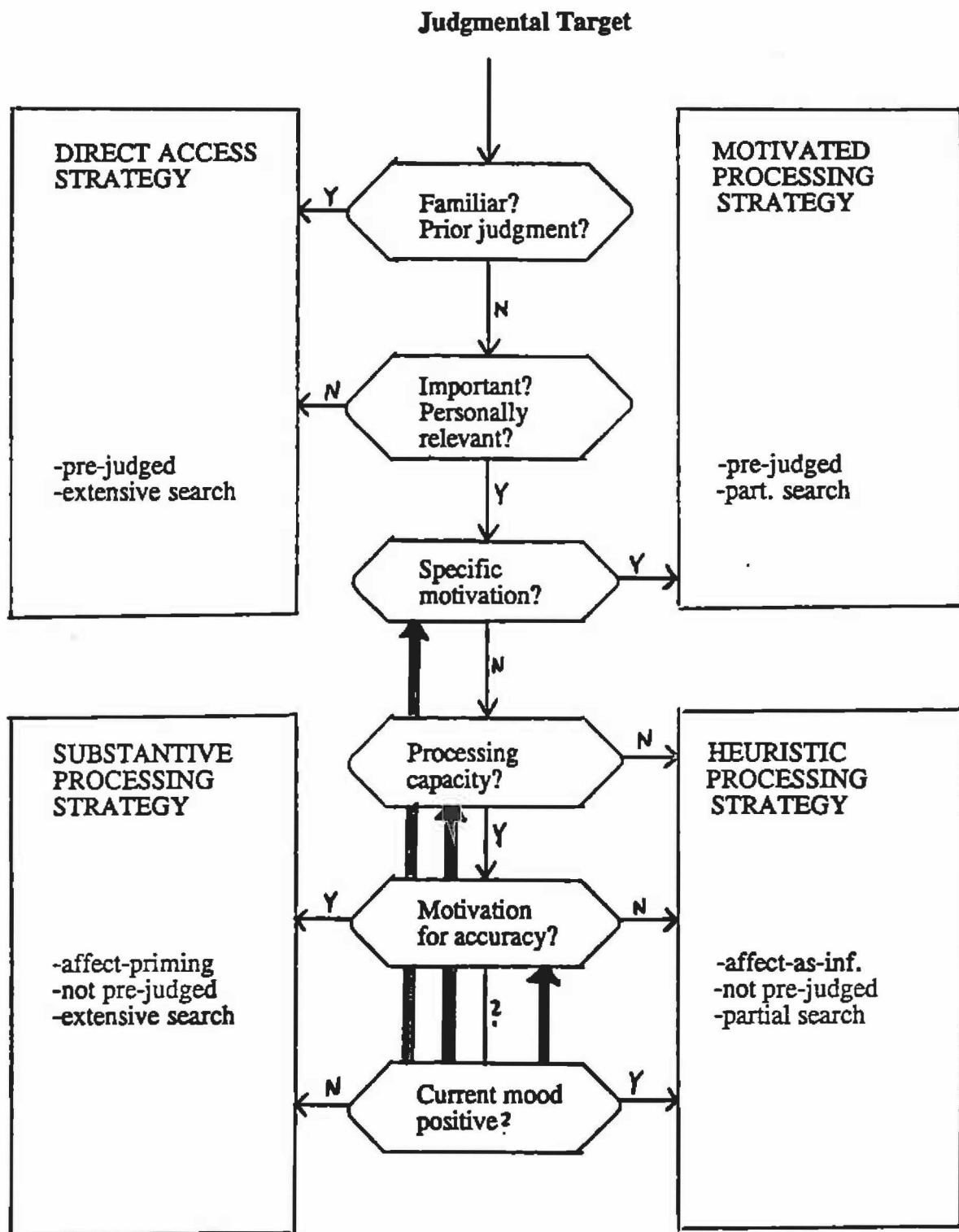


Fig. 8.

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